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first time. This is a profusion of echinid species and genera in a limited area surpassing anything hitherto found. Some of the thirty-seven genera are very rare and four are new. These are Pygospatangus, among the Spatangidæ, Stomaporus among the Brissidæ, Microlampas (Cassibulidæ), and Radiocyphus (Diadematidæ).

BOTANY.

The Flora of Central Nebraska.—A botanical collecting field perhaps as interesting as any to be found in the United States is the sand hill region of Central Nebraska. Not particularly interesting from its rare or remarkable flora, perhaps, but from the general ignorance in regard to it. Year after year Eastern collectors have passed over this *arid region* on their road to the Rockies, preferring pleasanter collecting fields.

This summer, while on a collecting trip for the Department of Agriculture, in company with Lawrence Bruner, western entomological agent for the Department, I spent several days on the Dismal and Loup Rivers, in Thomas county, Nebraska. As this is in the very heart of the sand hill region, a few notes especially on the Dismal River trip may not be without interest.

We started for the Dismal River, of which we had heard much from the settlers, in the early morning of the 12th of July. We were accompanied by Mr. Wright, a farmer of the place (Thedford), and Mr. Harper, a sportsman. For several miles we drove up the valley of the Middle Loup River, here a stream about fifty feet wide, averaging three feet deep, and with a remarkably swift current (about eight miles an hour). In the valley the grass is very rank, composed chiefly of *Agropyrum glaucum* R. & S., *Kœleria cristata* Pers., *Elymus canadensis* L., *Panicum virgatum* L., etc., intermixed with sedges, and in places with rank growths of *Onoclea sensibilis* L., and *Aspidium thelypteris* (L.) Swartz.

We soon left the bottom lands, and began climbing the sand hills up over the divide. From all that I had heard of them I expected now a long, tedious ride, but not so. I was surprised at the great variety of flowers we found. We were kept constantly busy pointing out the different kinds and watching the flight of insects. At times we wearied our driver not a little by the frequency of our stops, although for a farmer he was quite a naturalist. The prairies were spotted with the great white flowers of *Argemone platyceras* Link and Otto, and here and there could be seen the beautiful blue spikes of *Pentstemon cæruleus* Nutt., peeping above the grass or over the edge of some "blow-out," which I notice that they frequent. *Erigeron strigosus* Muhl. dotted the prairie all over, frequently rendering them gray with its little white flowers. Then our common evening primrose, *Œnothera biennis* L., I was not sorry to see, for it was one of my friends, and how rarely beautiful it was, with its unusually large flowers all coming into bloom at so nearly the same time. Perhaps its beauty is somewhat due to the stunted condition it has here in the sand hills. Its relative, the morning primrose I call it, *Œnothera serrulata* Nutt., also added beauty to the prairies with its numerous large yellow flowers. *Haplopappus spinulosus* D. C., *Amorpha canescens* Nutt., *Petalostemon violaceus* Michx., *P. candidus* Michx., *P. villosus* Nutt., *Ceanothus ovatus* Desf., *Eriogonum annuum* Nutt., *Lithospermum hirtum* Lehm., etc., were among the showy flowers of the prairie. We frequently passed bunches of *cactus* of several kinds, but it was too late for their flowers. On one bunch, however, of the common *Opuntia missouriensis* D. C., I found the flowers yet nicely out. It may be of interest to mention that a bud of this particular specimen, after it had been in my press three weeks, when laid out in the sun one day for a few minutes blossomed out as nicely as if in its original sand hills. Fully a month after this, when I opened the package at home containing this, I found that while done up between papers with its flowers perfectly pressed, it had grown a joint fully 1½ inches long.

Our driver told us that we might look for antelope and deer on the divide, but although we saw numerous signs, perhaps fortunately for the scientific interest of our trip we could discover nothing more.

As we approached the divide the region became more hilly, and from here on till we reached the Dismal River grew constantly more undulating, until, with the sand and increasing heat, travel became very tedious. Mr. Bruner's hands, face, and neck were burned to a blister by the hot sun, and my own were no better, About two o'clock in the afternoon, much to our satisfaction, we suddenly emerged from the hills, and descended at first gradually, then abruptly, into the valley of the Dismal River, our destination. We had ridden some twenty miles through sand-hills, had seen but one house,—a deserted sod shanty,—and not a sign of water. We stopped on the bank of the river and began to prepare for dinner. Mr. Bruner and I, with the natural instinct of collectors, started on a trip of discovery to get water, while the others were building a fire. While looking around on the bank of the creek one of the botanical discoveries of the trip was made. The little *Azolla caroliniana* Willd. (compared with specimens from California distributed by the Department of Agriculture, and one from Florida, collected by Canby), was found in considerable quantity growing in compact patches on the soft, black mud at the edge of the water. Underwood gives us the range of this interesting little plant "from New York to Florida, Arizona and Oregon,"—on both sides of the continent,—and now we have it in the very centre, the Nebraska sand-hill region. Near by, in little stagnant pools, the three duckweeds, *Lemna minor* L., *L. trisulca* L., and *Spirodela polyrrhiza* (L.) Schleid, grew in abundance, while out in the swift stream at this particular point (very common all along, as I observed afterwards) great masses of *Ranunculus aquatilis* L. var. *stagnatilis* D. C., and *Potamogeton* sp., waved back and forth with the current. The profusion of the small white blossoms of the former, with the background of green readily seen beneath the water, gave a pleasing effect. A spring was soon found, and with water we returned to dinner.

The appearance of the Dismal River at this point is very striking. A half mile away one would never suspect the presence of more than a small "draw" at most, but soon one begins a rapid descent, and suddenly we look over a small bluff, and there below us a hundred feet spreads out the green valley of the Dismal River. A small valley, indeed, here only about seven hundred feet in width, but from its location the most interesting I have ever visited. Turn this way, and one sees only sand-hill after sand-hill, stretching away as far as the eye can reach, the air over them quivering with the heat of an almost tropical sun ; face about, and there below is a green wooded belt, with underbrush in places forming almost a jungle, and, winding in and out, a clear, rippling stream. The coolness of the shaded valley seems to come rolling up in waves, enveloping the hot and tired collector as he gazes.

The bluffs on the south of the valley rise abruptly to the height of almost three hundred feet. At one time they were heavily wooded with the red cedar (*Juniperus virginiana* L.), of which a few remain, but settlers for miles around depend upon this for their fuel and post-wood. The brush from cut trees was thrown in rows, about a rod apart, extending up the bluffs, and a fire lately burned over great patches of this, doing much damage to standing trees, so that now from a distance the bluffs present a striking black and grayish-striped appearance.

After dinner we entered the wooded valley and began our search. Almost in the edge of the water near our stopping-place rank stems of *Glyceria arundinacea* Kunth., three feet high, and with a panicle about sixteen inches long, were gathered. This is not a rare species in many places, but has not been noted before for Nebraska. Near this, and still in the edge of the water, were *Glyceria nervata* Trin., and the common *Panicum virgatum* L. The trees commonly found growing in the valley were *Celtis occidentalis* L., *Prunus americana* Marshall, *Prunus demissa* Walpers, *Ulmus americana* (L.) Willd., *Cornus stolonifer* Michx., *Negundo aceroides* Mœnch., *Populus monolifera* Ait., *Salix longifolia* Muhl., *Rhus glabra* L., and in isolated patches or clumps *Shepherdia argentea* Nutt. The latter is found also on the edge of the bluffs above.

In the woods specimens of *Elymus striatus* Willd., *Agrostis exerata* Trin., and *Impatiens pallida* Nutt., were collected. The latter was very badly rusted (*Æcidium impatientis* Schw.). The rather rare grass *Oryzopsis micrantha* (Trin. and Rupr.), never before catalogued for Nebraska, grew in the edge of a pond, and near it, on wet, sandy soil, *Alopecurus geniculatus* L. var. aristulatus (Michx.) Torr.

H. J. WEBBER.

Botanical Laboratory, University of Nebraska.

[To be Continued.]

ZOÖLOGY.

Professor H. Gadow on the Homologies of the Auditory Ossicles.—The homology of the auditory ossicles does not seem to be yet settled. The last contribution to the subject is that of Herr Hans Gadow, now Strickland curator and lecturer on the advanced morphology of the Vertebrata, at Cambridge, England. (Philo. Trans. Royal Society, London, 1888, Vol. 179, pp. 451–485.) Professor Gadow carries the history of the first and second visceral arches through the entire vertebrate series, and illustrates his memoir with four quarto plates, which give the results of his labors. The possession of an ample collection of rare Elasmobranch forms, especially Heptanchus, Hexanchus, Centrophorus, Myliobates, and Trygon, with several fresh examples of Sphenodon, motived the examination of the question. Professor Gadow finds that in the Notidanidæ the first and second